

NHANES 1999-2000 Second Public Release Dataset

Lab06HM – Urinary Barium, Beryllium, Cadmium, Cobalt, Cesium, Molybdenum, Lead, Platinum, Antimony, Thallium, and Tungsten

Description

Urinary Barium, Beryllium, Cadmium, Cobalt, Cesium, Molybdenum, Lead, Platinum, Antimony, Thallium, and Tungsten

Trace metals have been associated with adverse health effects in occupational studies or laboratory studies, but have not been monitored in general population groups. Information on levels of exposure to these compounds is essential to determine the need for regulatory mechanisms to reduce the levels of hazardous pollutants to which the general population is exposed and to establish population-based reference intervals for several potentially toxic metals.

Eligible Sample

Participants aged 12 years and older who do not meet any of the exclusion criteria.

Data Collection Methods

Serum specimens are processed, stored, and shipped to the Division of Environmental Health Laboratory Sciences, National Center for Environmental Health, Centers for Disease Control and Prevention for analysis.

Examination Protocol

Detailed specimen collection and processing instructions are discussed in the NHANES Laboratory/Medical Technologists Procedures Manual (LPM). Vials are stored under appropriate frozen(- 20 degrees Centigrade) conditions until they are shipped to National Center for Environmental Health for testing.

Analytic Methodology

Urinary Barium, Beryllium, Cadmium, Cobalt, Cesium, Molybdenum, Lead, Platinum, Antimony, Thallium, and Tungsten

Inductively coupled plasma-mass spectrometry is a multi-element analytical technique¹. Liquid samples are introduced into the ICP through a nebulizer and spray chamber carried by a flowing argon stream. By coupling radio frequency power into flowing argon, a plasma is created in which the predominate species are positive argon ions and electrons. The sample passes through a region of the plasma having a temperature of 6000-8000 degrees K. The thermal energy atomizes the sample, then ionizes the atoms. The ions, along with the argon, enter the mass spectrometer through and interface that separates the ICP, which is operating at atmospheric pressure, from

the mass spectrometer, which is operating at a pressure of 10^{-6} torr. The mass spectrometer permits detection of ions at each mass in rapid sequence, allowing individual isotopes of an element to be determined. Electrical signals resulting from the detection of the ions are processed into digital information that is used to indicate the intensity of the ions and subsequently the concentration of the element. A total of fifteen elements including Be, Mn, Co, Ni, Mo, Cd, Sn, Sb, Cs, Ba, W, Pt, Tl, and Pb are measured in urine by inductively coupled plasma mass spectrometry based on the method by Kevin J. Mulligan et al ². Urine samples are diluted 1+9 with 2% v/v GFS double distilled concentrated nitric acid containing both iridium and rhodium for multi-internal standardization. This procedure may be used for all 15 elements or subsets of the 15 elements.

This method is used to achieve rapid and accurate quantification of multiple elements of toxicological and nutritional interest. The method is sensitive enough to be used to rapidly screen urine specimens from subjects suspected to be exposed to a number of important toxic elements or to evaluate environmental or other non-occupational exposure to these same elements.

Analytic Notes

Urinary Barium, Beryllium, Cadmium, Cobalt, Cesium, Molybdenum, Lead, Platinum, Antimony, Thallium, and Tungsten

Measures of this urinary multi-analyte profile are assessed in participants aged 6 years and over on a one-third sample. Use the special weights included in this data file when analyzing data. Read the **Special Sample Weights for this Dataset** section below before beginning analysis.

Special Notes for this Dataset

The analysis of NHANES 1999-2000 laboratory data must be conducted with the key survey design and basic demographic variables. The NHANES 1999-2000 Household Questionnaire Data Files contain demographic data, health indicators, and other related information collected during household interviews. The Household Questionnaire Data Files also contain all survey design variables and sample weights required to analyze these data. The Phlebotomy Examination file includes auxiliary information on duration of fasting, the time of day of the venipuncture, and the conditions precluding venipuncture. The Household Questionnaire and Phlebotomy Exam files may be linked to the laboratory data file using the unique survey participant identifier SEQN.

Special Sample Weights for this Dataset

Special sample weights are required to analyze these data properly. Please check the Analytic Guidelines posted for the file on the NHANES website.

References

- 1) Date, A. R., and Gray, A. L. Applications of Inductively Coupled Plasma Mass Spectrometry. Chapman and Hall, NY, 1989.
- 2) Mulligan KJ, Davidson TM, and Caruso JA. Feasibility of the Direct Analysis of Urine by Inductively Coupled Argon Plasma Mass Spectrometry for Biological Monitoring of Exposure to Metals. J Anal At Spectrom 1990;5:301.